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PROMOTION OF THE BEST AVAILABLE TECHNIQUES AND POSITIVE ECOLOGICAL SOLUTIONS FOR LEATHER INDUSTRY IN THE LIGHT OF EFFORTS CARRIED ON WITHIN LIFE+ PROGRAMME

Key words

Carbon footprint, BAT, leather industry, CO_2, Kyoto protocol.

Abstract

An effect on the environment and its protection play increasing importance in industrial activity. The leather industry has been trying for years to accommodate to increasing demands. The best examples are modernisations in tanneries, which notably have reduced the emissions. Nowadays, the producers must face up to new challenges. There is an increasing pressure to reduce the amount of greenhouse gases emitted by industry. The European Union has also started the promotion of the best available techniques (BAT) and reduction of "CO_2 footprint" by financing several projects. Within the footwear sector, examples of such projects are "ShoeBAT" and "CO_2Shoe" are carried on within LIFE+ programme. Beside of development of a tool for the calculation of the enterprise's effect on environment and providing the entrepreneurs with new knowledge on low emission techniques, in these projects there are gathered and analysed data related to the perception of environment protection issues by

entrepreneurs of leather industry from such countries as Poland, Spain, Portugal, Italy, and Belgium.

So far, research allowed us to draw the following conclusions:

1. Knowledge on BAT and problematics of greenhouse gases emissions is low among entrepreneurs of leather industry.
2. In majority of enterprises (tanning sector in particular), there are exploited obsolete techniques and processes which constitute a threat for environment. Some of the enterprises do not respect the relevant legislation, using inadequate techniques and/or not monitor the emissions.

The obtained image of knowledge on carbon footprint and BAT and the ecological awareness of leather sector entrepreneurs will be confronted with results of the planned questionnaire surveys that will allow evaluating the effectiveness of promotion tools developed within LIFE+ programme.

Introduction

The leather industry is commonly considered as environmentally unfriendly. In spite of continuous modernisation of tanning technologies and growing pressure towards the reduction of the effect on environment, the leather sector is treated as an unavoidable and the neighbourhood of the production plant is often perceived by local residents as an unwanted factor, which diminish a quality of life and reduces the prices of real estates.

On the other hand, in European Union tanneries (Spanish and Italian in particular), there has been significant technological progress achieved, which aims to accomplish ecological sustainability. Positive ecological modernisations have been made as the foremost activities to guarantee conformity with the demands of local societies. An active cooperation with all actors of the supply chain allowed achieving notable successes in the field of environmental protection. These changes include the following:

- Reduced water consumption,
- The substitution of hazardous chemical agents with less harmful ones,
- More efficient wastewater treatment,
- The reduction of generation and better reuse of biological wastes,
- Waste recycling, and
- Incineration and energy recovery from wastes.

The analysis of our leather sector indicates that further technological development is necessary. This development must harmonize with international standards as well as with the improvement of the ecological image of the whole sector. To achieve this aim, the priorities of changes and identified technologies have been outlined, which will significantly reduce the effect on environment. Additionally, the implementation of these technologies may bring notable financial benefits for entrepreneurs. However, usually the investments require significant financial expenses; moreover, the quality of the final product is often affected. In the ShoeBAT project, realised within a LIFE+ programme of European Union, data has been gathered on various best available technologies (BAT) in the leather sector, including implementation examples, advantages, and disadvantages of every solution.

One should highlight that Europe plays a significant role in international leather trading. Italy and Spain, the main European footwear producers, account for 20% [19] of the global leather footwear exports, with the European leather sector representing 23% of tanned leather produced worldwide [19]. On the one hand, the European footwear industry consists of a large number of small enterprises. However, there are differences between member states: French and German enterprises employ on average about 100 workers, while Spanish and Italian only 15. The other Member States are placed between these two extremes. For such small companies, it is very difficult to access to the most environmentally friendly techniques; therefore, the ShoeBAT project is primarily addressed to these SME companies. One should also stress that, despite of small size of leather companies, in total, the leather sector gives employment to huge number of workers. In 2009, the footwear sector covered 26,100 enterprises (including components suppliers), generating a turnover of €22 billion and a production added value of €20 billion, and directly employing 291,000 people [20].

1. Best available techniques for tanneries

In the project, the most important considered BATs mentioned in BREF document [1], which is a catalogue of commonly accepted as the best available technologies in the EU, were considered. Below we present a review of several BATs, including their advantages, disadvantages, and example applications.

1.1. Chromium-free tanning

At the moment, the most dominant method used in tanneries is processing leather with chromium salts. These chemical agents are considered as hazardous (EU Directive no. 2002/95/WE). Even small quantities of hexavalent chromium may negatively affect human health. Contact with contaminated substances is associated with occurrence of allergic symptoms. Hexavalent chromium penetrates cell membranes. When it enters the cell’s interior it is reduced to trivalent, which releases electrons damaging the cell’s membrane. Then it participates in the formation of the complex compounds, first of all with DNA, which leads to its deterioration and consecutively the occurrence of cancer [2].

Admittedly, restrictive legislation practically has completely eliminated CrVI; however, at the moment also CrIII is considered to be potentially dangerous. Additionally, there is always a risk of transformation of “harmless” CrIII into harmful CrVI [3]. The alternative for chromium technologies have been known for ages and had been used long before the chromium salt solution had been developed. Vegetable tanning methods are the foremost technologies. In comparison to the chromium technology, the vegetable method is inferior in many aspects. First of all, the rheology parameters of the product are affected. Therefore, research to substitute chromium with other substances continues to take place, for example, titanium.

Titanium has a proven usefulness for the production of leathers. It is a non-toxic metal that has several advantages. Titanium is biocompatible, inert, gives no allergic response.

Titanium bounds with leather's collagen in an analogical way to chromium. An unquestionable advantage is that titanium facilitates production of leathers in a wider range of colours. It is deprived of the chromium-tanning disadvantage – the occurrence of a blue tint, whereas titanium tanned leathers are characterized by a yellowish tone, which allows the tanners to obtain pale colours. The application of the technology does not require any additional costs; however, it also brings no significant savings and the main advantage is diminishing the effect on the environment (elimination of chromium, less chlorides and sulphates, grease and oils needed for baths) [4].

Titan tanning technology has been introduced in several tanneries, for example, in INCUSA Tannery in Spain.

The other tanning technology, which may be used instead of chromium salts, is tanning with oxazolidine compounds. Oxazolidines are saturated heterocyclic compounds prepared by reacting primary amino alcohols with formaldehyde. Monocyclic or bicyclic oxazolidine ring structures are formed, depending on the choice of starting chemicals [5]. Thanks to this technology, it is possible to obtain more biodegradable leathers with an appearance and properties suitable for the manufacture of shoes and other leather goods.

In relations to the effect on environment, the parameters of produced effluents are comparable with chromium tanning, but performed analyses have proven better biodegradability. Moreover, there is higher probability that chromium-free effluents may be reused, for example, in agriculture.

Regarding the proportion of oxazolidine used (3 or 5%), no differences were found in the leathers, which promotes the economic viability of the technology, since the higher oxazolidyne cost compared to chromium salts (2.5÷3 €/kg for oxazolidine versus 1 €/kg for chromium salts) is compensated by the lower dosage (3% of oxazolidine versus 8% of chromium salts).

Despite of numerous research projects that confirm the high quality of oxazolidine-tanned products, as well as the fact that ready-to-use formulas are available on the market (MP Angus Company), the tanneries approach with fear to the implementation of this technology and one should assume that the chromium tanning will still dominate in the future. Therefore, the eco-friendly technologies for tanneries using chromium are of importance. An example of such a technology is the separation of chromium salts from the aqueous effluent stream by precipitation, with dewatering of the precipitate. The precipitated chromium may be used as a partial substitute for fresh chromium salts or the chromium sludge may be used as a raw material by another industry. From the chemical point of view, chromium recovery is a simple process, but it needs strict analytical control and requires special equipment such as the following:

- A separate tank for collecting spent chromium tanning liquors;
- Material to analyse the chromium content, acidity, and alkalinity;
- A tank with stirrer and pH control for adding the right amount of alkali for the precipitation;
- A sedimentation tank for chromium hydroxide settling;
- A filter press or centrifuge for the chromium hydroxide sludge; and,
- A tank with stirrer and heating equipment for the re-solution of the chromium hydroxide by concentrated sulphuric acid.

In the case of double precipitation, the use of fossil flour to absorb fats and other chemicals present in the spent chromium tanning liquors is necessary – more filter presses, more chemicals, more time is required, and consecutively the higher costs are involved.

The liquors containing chromium are collected in a special tank, after which the chromium is precipitated by addition of an alkali. The precipitated chromium is separated from the supernatant, after which the chromium sludge is dissolved in concentrated sulphuric acid (for 1 kg Cr_2O_3 as precipitate about 1.9 kg H_2SO_4 is required). The supernatant is generally discharged to the effluent. Any alkali will precipitate chromium, but the stronger the alkali, the faster the rate of coagulation. Below we present several options:

- Sodium hydroxide or sodium carbonate will lead to a fast precipitation and voluminous sludge;
- Fast precipitation with additional agents (polyelectrolytes) to facilitate coagulation has the advantage that only simple dewatering is necessary;
- Slow precipitation, e.g. magnesium oxide, gives a denser sludge, which allows for decanting. (Another advantage of the use of MgO is that any excess addition will not cause the pH to rise beyond 10, so that any sludge redissolving at higher pH levels is avoided.)

Based on reports, the recovery processes are quite efficient (even 99.9%). The recovered chromium sulphate solution can be recycled into the tanning process by replacing up to 35% of the “virgin” chromium salt. Italy and Portugal each have one common chromium-recycling unit. The plant in Italy was designed to receive 400–500 m^3 exhausted floats per day from about 250 operators and produces 2000 kg Cr_2O_3 per day. The tanneries mostly use a mixture of 1 part recycled to 2 parts fresh chromium salts. The primary driver for establishing this plant was economics, because energy is saved because neutralization and filtration take place without the need of heating. Of course, environmental reasons were also taken into account; however, one should remember that chromium recovery requires the use of alkali, acids, and auxiliaries. Consequently, the quantity of neutral salts discharged to the effluents is increased. The effect on quality is insignificant. Chromium recycling also has the disadvantage that a slight change in the colour may occur, since organic compounds can produce a greyish tint. If the achieved quality of the final product is negatively affected by the use of recovered chromium, the chromium can be used for tanning of split. The disadvantages are not as severe as in recycling the liquors, because the concentration of organic compounds, which is usually low, does not disturb the precipitation process. Chromium recovered in this way resembles, in a higher degree, the quality of fresh chromium; therefore, this technique of chromium precipitation tends to be favoured over direct chromium recycling.

The technique can be implemented both in new and existing plants. It is independent of any local conditions and can be introduced in any tannery using chromium as a tanning agent. In practice, it has been applied in larger tanneries or in common effluent treatment plants. It is not appropriate for treating effluents from high-exhaustion chromium tanning.

The advantage of slow precipitation is that no investment in filtering equipment has to be made. However, it should be stressed that slow precipitation may not always be technically possible, as fat and protein impurities may interfere with the settling of the precipitated chromium. In consequence, the economic feasibility will depend on the exhaustion rate of the chromium-tanning agent and the quantity of chromium liquors generated. In general, the lower the exhaustion rate during tanning and the higher the volume of the floats, the higher the economic feasibility [13, 15].

Data from 2004 indicates that the investment cost for a chromium treatment plant for the treatment of 100 m^3 water containing chromium is approximately 350 000–450 000 EUR.

Several central chromium recovery installations have been constructed in European tannery conglomerations in order to benefit from economies of scale, e.g. Consorzio Recupero Cromo SpA, in Italy. Some individual tanneries have also been able to implement chromium recovery on site, e.g. in Germany (e.g. Bader and Gmelich) [16], and Italy and Sweden (Elmo Sweden AB) [14].

1.2. Replacement of hazardous chemical substances with environmentally friendly

Chromium salts are not the only substances that are harmful for environment. In various stages of production, there is a need to use chemicals, and an opportunity to introduce BAT.

Such a production stage is finishing. To achieve an attractive and desirable effect, leather is treated with various chemical substances, dyes foremost. Some dyes and pigments (particularly yellow, orange, green) contain heavy metals, such a cadmium, lead, chromium (VI)), which should be replaced by compounds based on organic substances. Unfortunately, organic pigments are less effective in concealing leathers' defects than "metallic" pigments; therefore, applicability of "organic" pigments is limited to high quality, spot- and scar less leathers. This limitation also affects the cost-benefit ratio since, despite of the fact that changes in production cost resulting from slightly higher price of "organic" pigments is insignificant, due to necessity to use high quality leathers, the final price is notably higher. Despite of this disadvantage, the technology has been implemented in several tanneries – in Spain it is used in 95% of the plants.

Another processing stage where the BAT may be introduced is the degreasing stage. There is an option to replace halogenated organic compounds either by non-halogenated solvents or by changing over to an aqueous degreasing system. The linear alkyl polyglycol ethers, carboxylates, alkyl ether sulphates, and alkyl sulphate can be applied.

In the stage of aqueous degreasing of sheepskins, there is a possibility to use of linear alcohol ethoxylates instead of alkylphenol ethoxylates. Surfactants are used in many different processes throughout the tannery, e.g. soaking, liming, degreasing of sheepskins, tanning, and dyeing. Nonylphenol ethoxylate (NPE) surfactants were used in the leather industry in the past. NPEs can be degraded to smaller chain NPEs and nonylphenol, both of which are toxic. The European Union carried out an extensive risk assessment of nonylphenol that concluded that nonylphenol displays an endocrine-disrupting activity. The use of NPE in leather processing is now restricted under the REACH regulation. Its use is banned, unless there are adopted such measures which prevent release to waste water or there are employed systems with special treatment where the process water is pre-treated to remove the organic fraction completely prior to biological waste water treatment (degreasing of sheepskins) as it is specified in point 46 of Annex XVII of the regulation [11]. In sheepskin processing, a closed loop cycle is adopted in order to avoid discharges of octylphenol and nonylphenol ethoxylates. The main alternatives in the degreasing of sheepskins are linear alcohol ethoxylates with different chain lengths and ethoxylation degrees. The efficacy of C10 linear alcohol ethoxylate as a degreasing agent is comparable to that of NPE. In this application, a nanophase with very low surface energy is formed that is converted into a macroemulsion. A process for the recovery of the surfactant and fat by solvent distillation using heptane and ethanol has been demonstrated on a pilot scale [17]. The best recovery rate found was 75%. Each one of the aliphatic ethoxylated alcohols has distinct properties, so that the process design differs depending on the material chosen; therefore, the process requires more attention than realized with "standard" methods. On the other hand, an advantage of the technology from the point of view of the producer is the lack of the necessity of preliminary purification of effluents before the biological purification.

The other substances containing halogenated compounds are flame retardants. Actually, firm leather with a dense fibre interweaving is itself more flame resistant than other leather types [8]. Therefore, flame resistance is possible by applying appropriate syntans and the addition of melamine resins in the retanning process, as well as by selecting suitable fatliquors. Furthermore, the application of, e.g. ammonium bromide, leads to a flame-retardant effect that is sufficient for some applications. As an alternative to brominated flame-retardants, phosphorus compounds, such as ammonium polyphosphate, may be applied. Additionally, silicon polymer products used in finishing can give some fire resistance, in that they burn to leave a residue of silica (SiO_2) which protects the leather. The advantage of the technique is that it can be applied to both new and existing installations. Unfortunately, for some types of leather, the affinity to the leather is insufficient. The flame proofing of some types of waterproof leather may still require the use of halogenated chemicals. The technology has been introduced in large number of installations in Europe.

1.3. Reduction of water consumption

The tanning sector is commonly considered as water consuming, so it is not a surprise that tanneries are looking for solutions reducing water input. Of course, the concern for environment is not a sole reason. The cost of water and resulting management of wastewater is, at the moment, one of the most notable component of costs. One should stress that the majority of Polish and European tanneries, even those that represent an "average" level, have achieved significant success in this field. According to criteria related to the "ecolabel" award, the following limits to water consumption for the tanning of hide and skin shall not be exceeded [6]:

- Hides: 35 m^3/t,
- Skins: 55 m^3/t.

Based on IPS's knowledge, most Polish tanneries meet these requirements. Regarding the other countries, a water consumption of approximately 12–25 m^3/t (for bovine hides) can be achieved if the tannery operates efficient technical control and good housekeeping. The economic feasibility of a change in consumption to this level depends greatly on the cost of consumed water. In Germany, some tanneries use 15–20 m^3/t. A tannery in the Netherlands, processing bovine hides, uses about 20 m^3/t.

The way that is possible to reduce the amount of water consumption is to adopt various technologies, for example, purifying and storage of wastes used at the initial stages of production. For the purpose of the secondary use, post-tanning and post-dyeing water is purified in a sedimentation tank and used for soaking in the liming drum and as post-liming washes. Acidic effluents are purified mechanically and then alkalized and sedimented with the addition of polyelectrolytes and metal salts. The obtained purified water is used for soaking in the first rinse stage after liming. Water from the second soaking after liming should be collected and sedimented and may be used for the first soaking. Due to high sulphide and organic contamination, the first rinse requires the treatment to be purified. This technique provides savings equal to 20% of total water consumption. On the other hand, the side effects include a build-up of the salt content, an increase in temperature, as well as problems arising during biological treatment of the effluents. One should also take into account higher energy consumption and a more complicated production scheme, which consecutively may require increased employment. However, calculations based on data obtained in the reference company with 90 employees (Josef Heinen GmbH & Co. Kg, Wegberg) assume that average savings are 40 000 EUR per year and there was no reported any deterioration of quality [9]. It was achieved at the investment cost of 298 000 EUR.

In Poland, the sensible solution seems to be the management of rainwater. The amount of rainwater that falls onto a tannery site will vary according to the weather pattern for the locality. It is good practice for rainwater falling on the roofs of the buildings to be collected separately from the process effluent so as to reduce the volume of water requiring treatment. It may be useful to store it for use both in process operations as well as for general use (cleaning).

A further reduction in water consumption can be obtained if rainwater falling onto all area of the tannery is also diverted away from the process effluent stream. Rainwater from paved yard areas in which spills of process substances (chemicals) are present is collected as a process effluent; therefore, it is recommended to design operations so that the yard area used is as small as possible, so as to minimize the amount of rainwater collected [7].

The other question is cost-benefit ratio of the investment. In Poland, on average, there is reported 600 mm of rainwater per year. So it is possible to gather (theoretically) 6 000 m^3 per hectare, which (based on ecolabels criteria) is enough to process about 171 tonnes of hides. The rates for delivery of water and collection of sewage vary in various areas of Poland, but, for the assumed cost of 15 PLN, the potential saving are 90 000 PLN.

1.4. Reduction of chemical content

Regardless the efforts to substitute the hazardous agents with harmless ones, there is always a necessity to use agents that are a potential burden for the environment.

It is possible to achieve by the rearrangement of production stages. An example of such an approach is to split leather in the earlier stage of production to reduce the amount of leather to be treated with tanning agents (obtained wastes are not subjected to the further treatment). Savings in chemicals per square meter of the final product during the stage between liming and shaving are directly proportional to the weight of wastes generated in the lime splitting; moreover, eventual non-tanned wastes are less harmful to the environment and, in comparison to the tanned leather, comparatively well biodegradable. The technology's inconvenience is the fact that leather split after liming may require more shavings after tanning since splitting after liming is less precise. It may lead to the generation of more wastes. Therefore, in applications where more uniform and exact thickness is required, the after liming splitting is unavoidable. Moreover, in the case of extremely thin leather, after liming splitting may result in diminished efficiency of the splitting process. In such cases, after tanning splitting may be a recommended solution, since the split leather may be used in further processes [13].

Theoretically, this technology may be used in old and new installations, but it requires purchase or modification of splitting machines. Machines used in after liming splitting and post tanning splitting are generally identical; however, it is necessary to introduce some modifications, more precisely, there are required rollers of different hardness and roughness, due to these disadvantages, a single machine cannot be used for both methods of splitting simultaneously. Investment costs include about 140 000 EUR per new splitting machine. In case of a used machine, the cost may be significantly reduced.

The other option to reduce chemical agent consumption is to use "intelligent" chemicals. An example of such a solution is to carry out dehairing by dissolving the hair root rather than the whole hair. Consecutively, the concentration of hair breakdown products in the effluent is reduced. The hair comes out of the follicle without being macerated and its structure is preserved. The obtained hair may be managed by various methods. Although it is difficult to find an economic outlet, hair can be reused as filling material or as a fertiliser (low rate of releasing nitrogen). An example plant in Sweden has implemented hair-saving since the end of 1998 for all production. The generated hair is used by local farmers as a fertilizer [10].

Generally, sheep wool and goat hair are easier to sell. The biggest advantage is that hair is not included in liquid effluents. Hair has a very high organic load; therefore, its presence in effluents would result in high production of sludge. Additionally, there is a lower volume of sludge for disposal or treatment (The volume of sludge is reduced by 15–30%, there are also reports that there may be obtained a reduction of the amount of sludge dry matter to 100–110 kg per tonne raw hide). Moreover, a saving on wastewater treatment chemicals is achieved.

The hair-save dehairing techniques are based on the different chemical behaviour between the proteins keratin and collagen. Collagen is the leather-making protein of the hide while keratin is the insoluble protein, stabilised through disulphide (-S-S-) bonds. The resistance of keratin to chemical degradation can be substantially increased by treatment with alkali (but without sulphides). The alkali transforms the sulphur cross-links into different, highly resistant thioester bonds. Mature keratin is much more easily immunised than immature keratin. This increases the difference in degradability between hair and hair roots; thus simplifying the hair-save dehairing technique. Immunisation can be achieved by using sodium hydroxide, lime, or calcium hydroxide and usually takes 1–1.5 hours. Several commercial hair-save techniques are available on the market. One should admit these solutions are not suitable for all types of raw hides and leather products. In Italy, this technique is applied to bovine hides for footwear, leather goods, and upholstery, but not to bovine leather used for the production of sole leather or to goatskin.

A hair-save technology for sheepskins, called painting, consists of the application of a semifluid paste on the flesh side of the skin, composed of an inert material (kaolin or other) containing sulphide and lime. The treatment is carried out in a warm environment (max. 30°C) and takes several hours [18].

Modern hair-save dehairing techniques include special equipment for recirculating the float and separating the hair. Hair separation is preferably carried out simultaneously with hair loosening, so as to minimise the degradation of the hair [13].

The technique requires capital investment for existing tanneries. The basic investment includes cost for a drum (wooden, size 4 × 4 metres) equipped with a system for recycling water and with a filter for hair removal is around EUR 100 000–130 000. Besides this cost, there will be costs for the reinforcement or construction of appropriate concrete foundations. An existing drum can be rebuilt introducing channels and washing systems to recycle the float in order to separate the hair. The cost is estimated at EUR 5000–10 000.

Examples of tanneries that introduced this BAT are Elmo Sweden AB, Rino Mastrotto Group – Division Calbe (Italy), Lapuan Nahka (Finland) [14].

During deliming, there is eliminated the alkalinity caused by lime on the collagen. Ammonium salts (NH4Cl) are usually used for this process. At the moment, it is recommended to replace it by weak organic acids. Examples of such substances are Magnesium lactate, organic acids such as lactic acid, formic acid and acetic acids, or esters of organic acids. Environmental benefits that can be achieved using this technique are reduction of nitrogen in the effluents and a reduction of gaseous ammonia. The deliming products are usually based on various organic and inorganic acids, esters of carboxylic acids, non-swelling aromatic acids, etc. A deliming auxiliary based on esters of carboxylic acids will normally be added at a concentration of 1.5% on pelt weight. These agents increase the COD load [13]. No data have been made available to evaluate the substitution of ammonium in the effluents against a higher COD load and against the effects of the various substitutes mentioned above.

The technique can be applied to both new and existing plants. Negative opinions have not been reported on the quality, on the contrary, positive effects on the quality of the pelts are observed.

A significant disadvantage is that ammonia-free deliming with commercial products may be more than six times as expensive as deliming with ammonium salts; on the other hand, less bating agent is subsequently needed. [12, 13].

Conclusions

Within the ShoeBAT project, there have been identified nearly seventy BAT for tannery and footwear industries, which gives an opportunity to nearly every company to improve their eco-friendliness; however, many of these BAT are beyond the capabilities of various tanneries. Tanning process requires several stages to process a leather from raw hides up to high quality leathers. It is not possible to make the whole process completely environmental friendly; it simultaneously offers a great opportunity to improve even a single stage. Entrepreneurs, encouraged by legislation (ban on several chemical products) as well as increasing cost of management of several products (for example water), have developed/introduced various methods. Their successful implementation depends on several factors, sometimes independent of the entrepreneur (climate, availability of raw materials). Additionally, tanneries in Europe are under heavy pressure of competition from countries (Pakistan and India foremost), which (in practice) do not take care of the environment and therefore may offer much cheaper products. Therefore, European tanneries, before introduce any BAT, have to take into account many factors, mostly economical. One should admit that some investments may be supported financially by EU, but this support is limited only to initial investments, whereas regular activity (e.g. purchase of chemicals) is entirely on the entrepreneur.

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Promocja najlepszych dostępnych technik oraz proekologicznych rozwiązań dla przemysłu skórzanego w świetle prac prowadzonych w projektach programu life+

Słowa kluczowe

Ślad węglowy, najlepsze dostępne techniki, BAT, przemysł skórzany, CO_2, protokół z Kioto.

Streszczenie

Oddziaływanie na środowisko i jego ochrona odgrywają coraz istotniejszą rolę w trakcie prowadzenia działalności przemysłowej. Przemysł skórzany od lat stara się dopasować do wzrastających wymagań. Najlepszym przykładem są zmiany w garbarniach, które znacząco zmniejszyły emisję zanieczyszczeń. Obecne czasy stawiają przed producentami nowe wyzwania. Wzrasta presja, aby zmniejszyć poziom generowanych przez przemysł gazów cieplarnianych. Do promowania najlepszych dostępnych technologii (BAT) i obniżenia „śladu węglowego” produktów włączyła się również Unia Europejska, finansując

szereg projektów. W obszarze przemysłu skórzanego przykładem takich projektów są „ShoeBAT" oraz „CO_2Shoe" realizowane w ramach programu LIFE+. Oprócz opracowania narzędzi do obliczania wpływu działalności przedsiębiorstwa na środowisko oraz dostarczania przedsiębiorcom wiedzy na temat niskoemisyjnych technik, w ramach tych projektów są zbierane i opracowywane dane dotyczące postrzegania kwestii ochrony środowiska przez przedsiębiorców z branży skórzanej z takich krajów jak: Polska, Hiszpania, Portugalia, Włochy, Belgia.

Prowadzone dotychczas badania pozwoliły sformułować następujące wnioski:

1. Znajomość BAT oraz problematyki emisji gazów cieplarnianych wśród przedsiębiorców z branży skórzanej jest niska.
2. W znacznej części przedsiębiorstw, zwłaszcza z branży garbarskiej, stosowane są przestarzałe techniki i procesy stwarzające zagrożenia dla środowiska. Niektóre z przedsiębiorstw nie stosują się do regulacji prawnych, wykorzystując niewłaściwe techniki i/lub nie monitorując emisji.

Uzyskany obraz wiedzy przedsiębiorców z przemysłu skórzanego na temat śladu węglowego oraz BAT, a także świadomości ekologicznej, zostanie skonfrontowany z wynikami przewidzianych w projektach badań wśród tych przedsiębiorców, co pozwoli na ocenę skuteczności oddziaływania zbudowanych w ramach projektów LIFE+ narzędzi promowania prośrodowiskowych rozwiązań.